(17)

PATENT ABSTRACTS OF JAPAN

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(54) PHASED ARRAY ANTENNA

CLAIMS

[Claim(s)]

[Claim 1] Two or more component antennas which constitute a phased-array antenna, and two or more transceiver modules prepared in each component antenna, At the time of transmission, transmitted power is distributed to each transceiver module. At the time of reception The feeder circuit which carries out power composition of the power received by each transceiver module for every quadrant of an antenna, The comparator which subtracts and adds the received power of each quadrant of the antenna compounded in the feeder circuit, and outputs a sum signal and a difference signal, The beam controller which gives the control signal corresponding to a beam direction to the above-mentioned transceiver module, The phased-array antenna characterized by having the amplifier which carries out magnification branching of the output of a specific transceiver module, the phase shifter which amends the phase shift of the amplified input signal, and the phase shift controller which controls a phase shifter.

[Claim 2] Two or more component antennas which constitute a phased-array antenna, and two or more transceiver modules and high power transceiver modules prepared in each component antenna, At the time of transmission, transmitted power is distributed to each transceiver module. At the time of reception The feeder circuit which carries out power composition of the power received by each transceiver module for every quadrant of an antenna, The comparator which subtracts and adds the received power of each quadrant of the antenna compounded in the feeder circuit, and outputs a sum signal and a difference signal, The phased-array antenna characterized by having the beam controller which gives the control signal corresponding to a beam direction to the above-mentioned transceiver module, the phase shifter which amends the phase shift of the signal which branched the output of a high power transceiver module, and the phase shift controller which controls a phase shifter.

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[Translation done.]

TECHNICAL FIELD

[Industrial Application] This invention relates to the unsymmetrical phased-array antenna which has a difference in the total of the transceiver module for every quadrant of an antenna.

[Translation done.]

PRIOR ART

[Description of the Prior Art] Drawing 3 is what shows the unsymmetrical phased-array antenna which has a difference in the total of the transceiver module for every quadrant of the conventional antenna. A component antenna and 2 boil a transceiver module, 3 boils transmitted power, respectively at the time of transmission, and 1 distributes it to the transceiver module 2. The feeder circuit which carries out power composition of the power received by each transceiver module 2 for every quadrant of an antenna at the time of reception, 4 subtracts and adds the received power of each quadrant of the antenna compounded in the feeder circuit 3. The comparator which outputs a sum signal and a difference signal, the beam controller with which 5 gives the control signal corresponding to beam orientation to the transceiver module 2, The signal with which, as for 6, the beam controller 8 controls the phase shift of the transceiver module 2, the sum signal with which the input signal from each transceiver module 3 or the sending signal from a feeder circuit 3, and 8 are outputted for 7 from a comparator 4, the difference signal with which 9 is outputted from a comparator 4, and 10 are based on antennas.
[0003] The unsymmetrical phased-array antenna which has a difference in the total of the transceiver module for every quadrant of the conventional antenna is constituted as mentioned above. Conventionally, the unsymmetrical phased-array antenna which has a difference in the total of the transceiver module for every quadrant of this kind of antenna outputs the signal 6 which controls the transceiver module 2 from the beam controller 5 to receiving beam direction theta, and turns a beam to receiving beam direction theta. From receiving beam direction theta, each transceiver module 2 receives an electric wave, and power composition of the received power is carried out for every quadrant of delivery and an antenna in a feeder circuit 3. Delivery, the sum signal 8, and the difference signal 9 are outputted for the received power for every quadrant of an antenna to a comparator 4. The Naru point was formed in receiving beam direction theta+delta theta controlled by the beam controller 5 like drawing 5 , and the output of the difference signal 9 was performing the angle track with this difference signal 9.

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[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention] Since this invention is constituted as explained above, an amplifier or a high power transceiver module and a phase shifter, and a phase shift controller are added, and magnification branching of the output of the transceiver module set to the quadrant with few transceiver modules is carried out, or the output of a high power transceiver module is branched, and it becomes that it is possible for an unsymmetrical phased-array antenna to also raise angle track precision by amending the phase shift of that output with a phase shifter.

[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] As shown in drawing 4 , the unsymmetrical phased-array antenna which has a difference in the total of the transceiver module for every quadrant of this conventional antenna divides an antenna effective area into four quadrants 16-19, if it thinks with the component antenna 1 and an unsymmetrical antenna with the part 20 without the transceiver module 2, will receive the electric wave which carries out incidence from receiving beam direction theta, and will compound received power for every quadrant in a feeder circuit 3. The received power is outputted with a comparator 4, a sum signal is outputted by total of the received power of four quadrants 16-19, and the difference signal 9 of the AZ direction outputs what lengthened the sum of the received power of two quadrants 17 and three quadrants 18 from the sum of the received power of one quadrant 16 and four quadrants 19. The difference signal 9 of the direction of EL outputs what lengthened the sum of the received power of three quadrants 18 and four quadrants 19 from the sum of the received power of one quadrant 16 and two quadrants 17. Thereby, the difference signal 9 which is comparator 4 output of drawing 3 serves as an output like drawing 5 . When the number of the transceiver modules 3 of each quadrant differs [the electric wave which carries out incidence from receiving beam direction theta by which the beam controller 5 controlled the difference signal 9 of comparator 4 output], received power also differs for every quadrant and the Naru point is formed in the place where only deltatheta shifted from receiving beam direction theta. Therefore, an exact angle error could not be detected but there was a problem that angle track precision will fall.
[0005] This invention was made in order to cancel the above technical problems, it receives an electric wave by such unsymmetrical phased-array antenna, and sets it to few

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quadrants of the transceiver module 2. The phase shifter which amplifies the output of a certain transceiver module 2, branches the amplified received power and amends the phase shift of the received power, When it thinks by the symmetrical phased-array antenna with the beam controller 5, the amount of phase shifts to receiving beam direction theta of a part without the transceiver module 2 is calculated, and a phase shift difference with the received power which carried out magnification branching is computed. moreover, the phase shift which carried the phase shift control circuit which controls a phase shifter, and was computed with the beam controller 5 -- the shift of receiving beam direction theta to deltatheta of the Naru point of the difference signal 9 of the comparator 4 when turning to receiving beam direction theta is lost by amending difference and inputting into a feeder circuit 3. It aims at improving the angle track precision of the unsymmetrical phased-array antenna which has a difference in the total of the transceiver module for every quadrant of an antenna by this.

[Translation done.]

MEANS

[Means for Solving the Problem] the phase shift which the unsymmetrical phased-array antenna in this invention added the amplifier or a high power transceiver module and a phase shifter, and the phase shift controller, and carried out magnification branching of the output of the transceiver module 2 set to few quadrants of the transceiver module 2, or branched the output of a high power transceiver module, and computed the phase shift of that output with the beam controller 5 -- difference is amended and the approach of inputting into a feeder circuit 3 is used.

[Translation done.]

OPERATION

[Function] The unsymmetrical phased-array antenna in this invention, the phase shift which added the amplifier or a high-power transceiver module and a phase shifter, and the phase shift controller, and carried out magnification branching of the output of a certain transceiver module 2 in few quadrants of the transceiver module 2, or branched the output of a high-power transceiver module, and computed the phase shift of the output with a beam controller 5 -- it is possible to amend difference, to make the received power of each quadrant into this power using the approach of inputting into a feeder circuit 3, and to lose the shift of a Naru point Angle track precision is improved by this.

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[Translation done.]

EXAMPLE

[Example] Drawing explains one example of this invention below example 1. In drawing 1 , 1 to 10 is the same as that of the above-mentioned conventional unsymmetrical phased-array antenna. It is the new received power with which had the amplifier with which 11 carries out magnification branching of the output of a certain transceiver module 2, the phase shifter which amends the phase shift of the received power in which 12 carried out magnification branching, the phase shift controller with which 13 controls a phase shifter, the phase shift difference which sends 14 to a phase shift controller from the beam controller 5, and 15 in the control signal to a phase shifter, and 16 had the phase shift amended.

[0009] In the unsymmetrical phased-array antenna constituted as mentioned above, the transceiver module 2 is controlled so that a beam directs in a receiving beam direction with the beam controller 5. In order to make the same received power in each quadrant of an antenna, in few quadrants of the transceiver module 2, magnification branching of the output of a certain transceiver module 2 is carried out with amplifier 11, and phase shift amendment of the output signal is carried out with a phase shifter 12 at coincidence. With the beam controller 5, the phase shift set as a phase shifter 12 computes the amount of phase shifts of the fictitious transceiver module 2, and amends the difference of the computed amount of phase shifts, and the amount of phase shifts set as a certain transceiver module 2. The new received power by which phase shift amendment was carried out through the phase shifter 12 is inputted into a feeder circuit 3. If this new received power is inputted into a feeder circuit 3 with the received power of the fictitious transceiver module 2 and the received power of each transceiver module 2 is compounded, the received power in each quadrant will turn into this power. Therefore, the Naru point of receiving beam direction theta is formed, without the difference signal 9 of comparator 4 output shifting like drawing 4 . Thus, angle track precision can be improved by adding an amplifier 11, a phase shifter 12, and the phase shift controller 13, carrying out magnification branching of the output of the transceiver module 2 set to few quadrants of the transceiver module 2, and amending a phase shift with a phase shifter.

[0010] Drawing explains one example of this invention below example 2. In drawing 2 , 1 to 10 is the same as that of the above-mentioned conventional unsymmetrical phased-array antenna. It is the new received power with which had the high power transceiver module which has arranged 22 instead of some transceiver modules 2 to few quadrants of the transceiver module 2, the phase shifter which amends the phase shift of the received power with which 12 branched the received power of the high power transceiver module 22, the phase shift controller with which 13 controls a phase shifter, the phase shift difference which sends 14 to a phase shift controller from the beam controller 5, and 15

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in the control signal to a phase shifter, and 16 had the phase shift amended.
[0011] In the unsymmetrical phased-array antenna constituted as mentioned above, the transceiver module 2 is controlled so that a beam directs in a receiving beam direction with the beam controller 5. In order to make the same received power in each quadrant of an antenna, to coincidence, the output of the high power transceiver module 22 is branched in few quadrants of the transceiver module 2, and phase shift amendment of the output signal is carried out with a phase shifter 12 at it. With the beam controller 5, the phase shift set as a phase shifter 12 computes the amount of phase shifts of the fictitious transceiver module 2, and amends the difference of the computed amount of phase shifts, and the amount of phase shifts set as a certain transceiver module 2. The new received power by which phase shift amendment was carried out through the phase shifter 12 is inputted into a feeder circuit 3. If this new received power is inputted into a feeder circuit 3 with the received power of the fictitious transceiver module 2 and the received power of each transceiver module 2 is compounded, the received power in each quadrant will turn into this power. Therefore, the Naru point of receiving beam direction theta is formed, without the difference signal 9 of comparator 4 output shifting like drawing 4 . Thus, angle track precision can be improved by adding the high power transceiver module 22, a phase shifter 12, and the phase shift controller 13, branching and amending the output of the high power transceiver module 22 with a phase shift and a phase shifter in few quadrants of the transceiver module 2.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the configuration block Fig. showing one example 1 of this invention.
[Drawing 2] It is the configuration block Fig. showing one example 2 of this invention.
[Drawing 3] It is the configuration block Fig. showing the conventional unsymmetrical phased-array antenna.
[Drawing 4] It is the effective area of the conventional unsymmetrical phased-array antenna.
[Drawing 5] It is the difference signal of the conventional unsymmetrical phased-array antenna.
[Description of Notations]
1 Component Antenna
2 Transceiver Module

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3 Feeder Circuit
4 Comparator
5 Beam Controller
6 Transmitted Power or Received Power
7 Signal Which Controls Transceiver Module by Beam Direction from Beam Controller
8 Sum Signal
9 Difference Signal
10 Antenna Core
11 Amplifier
12 Phase Shifter
13 Phase Shift Control Circuit
14 Phase Shift Difference Calculated with Beam Controller
15 Control Signal to Phase Shifter
16 New Received Power Which Had Phase Shift Amended
17 One Quadrant of Antenna
18 Two Quadrants of Antenna
19 Three Quadrants of Antenna
20 Four Quadrants of Antenna
21 Part without Transceiver Module
22 High Power Transceiver Module

[Translation done.]

DRAWINGS

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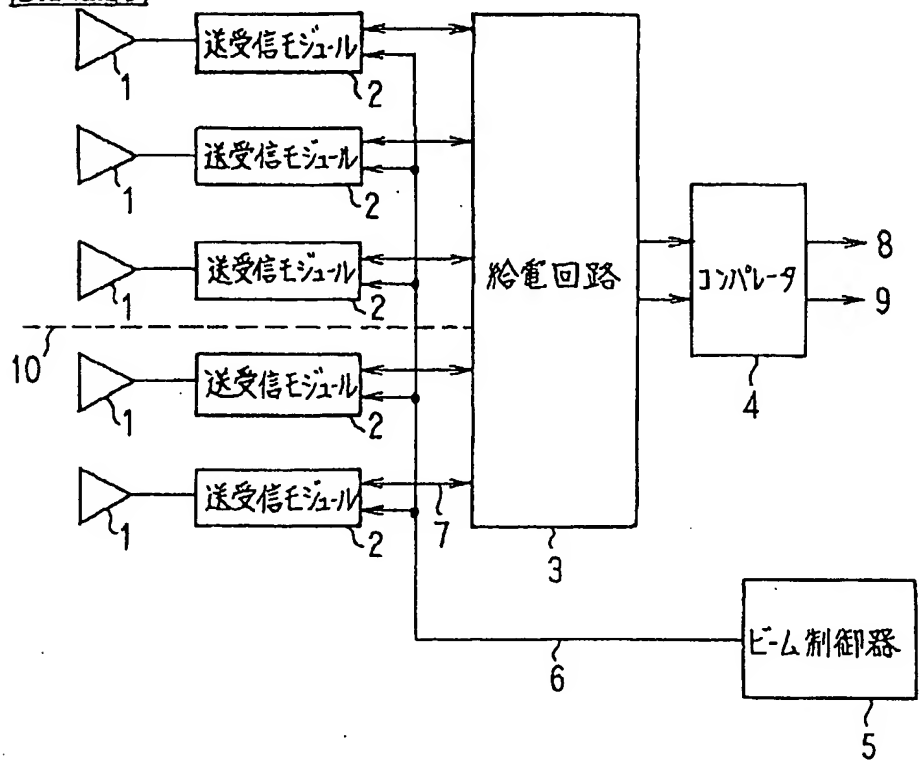
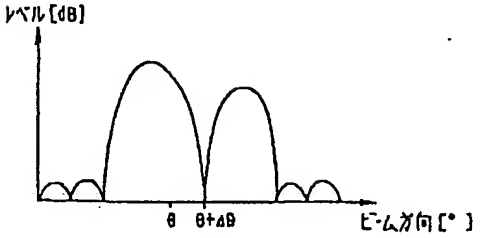
[Drawing 3]



[Drawing 5]



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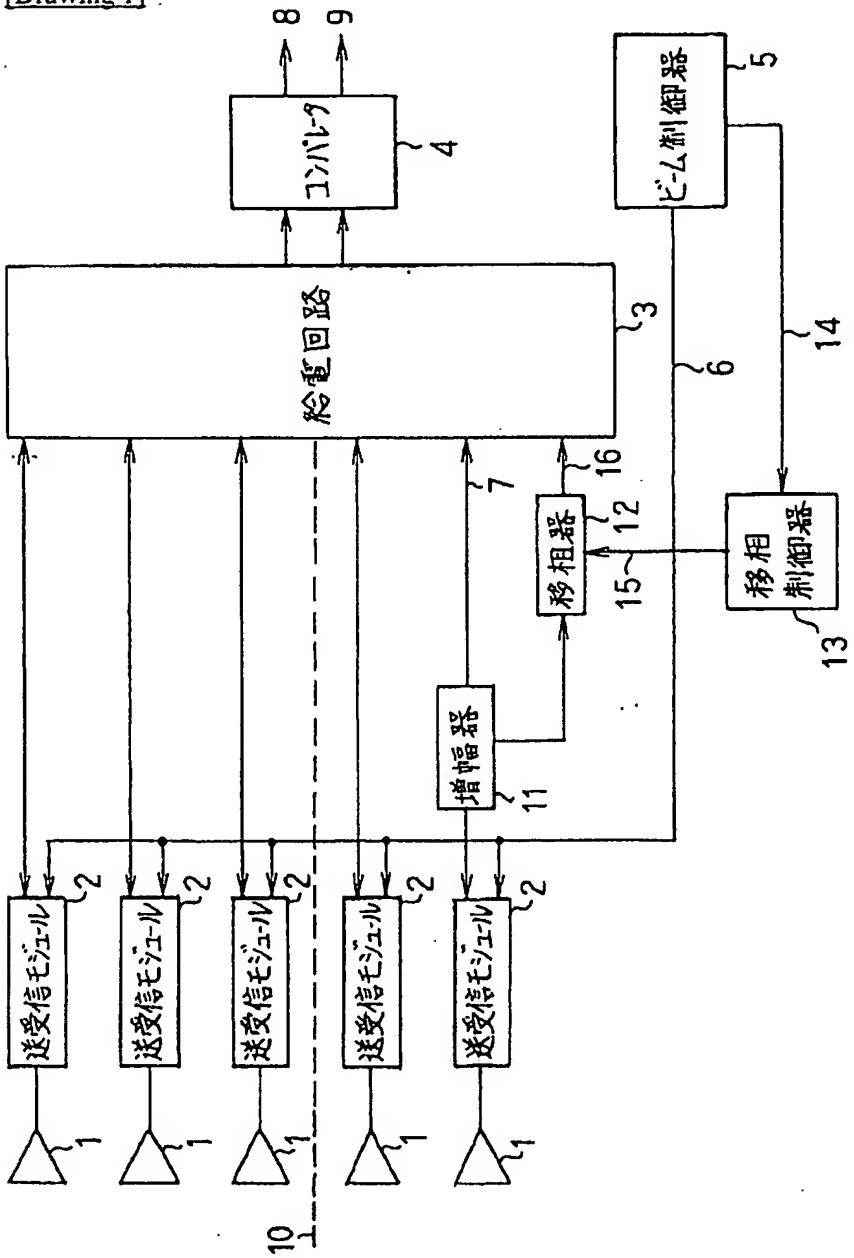
[Drawing 1]



[Drawing 2]

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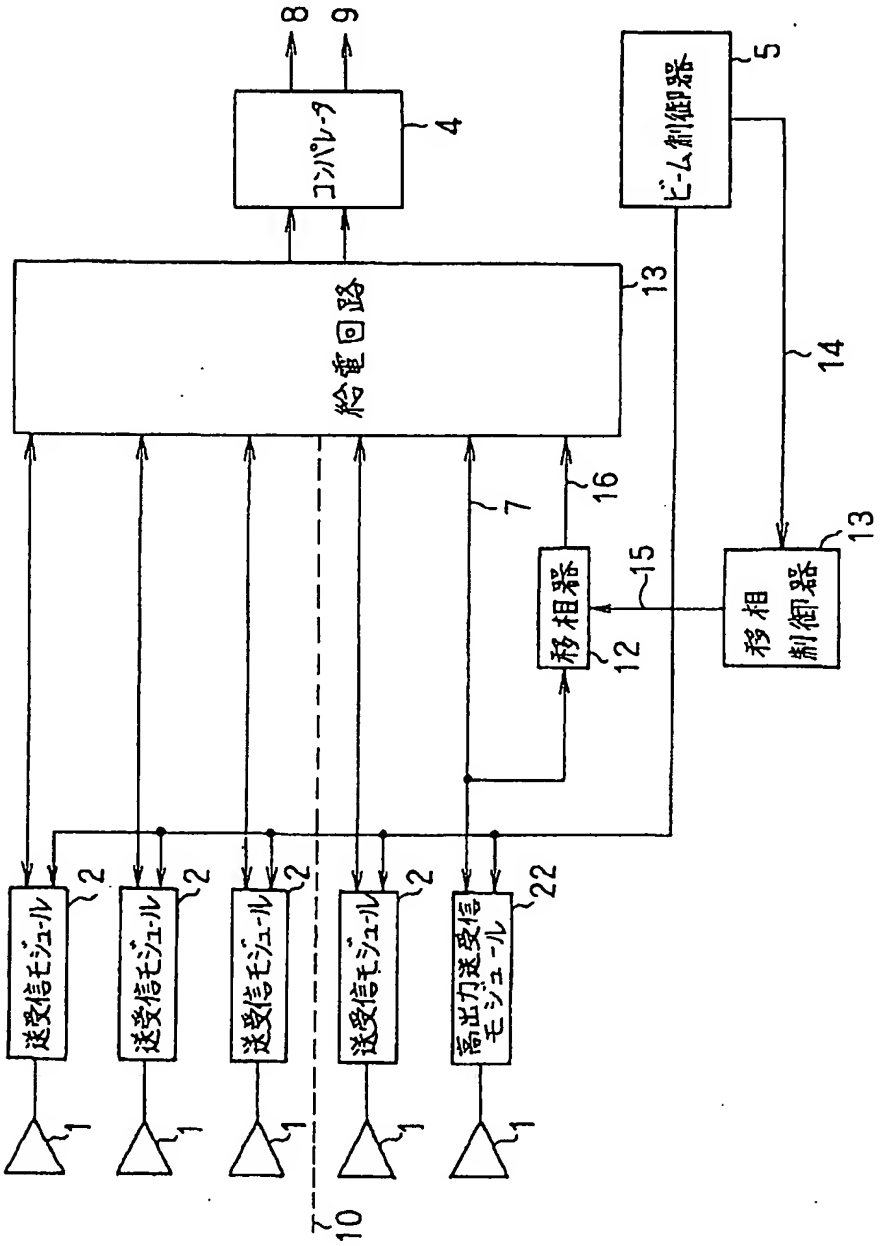

[Drawing 4]

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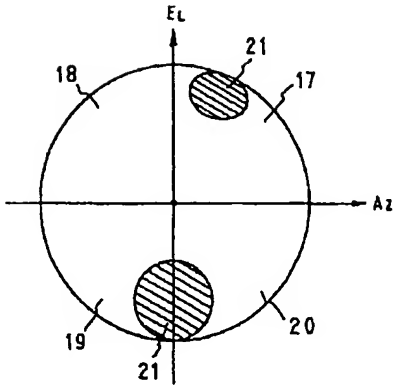

[Translation done.]